BEST PRACTISES AND LESSONS LEARNED FROM DIGITAL TRANSFORMATION PROCESSES IN PUBLIC ADMINISTRATIONS OF SIX EUROPEAN COUNTRIES

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ABSTRACT

This article investigates the processes of digital transformation in public administrations across several European countries: Denmark, the Netherlands, Romania, Estonia, Sweden and Latvia. Each case study provides insight into how different countries are tackling the challenges of digitisation within specific contexts. In Denmark, the article examines how the country is addressing the modernisation of legacy systems to comply with European Union standards, emphasising the importance of change management and a progressive approach. In the Netherlands, the focus is on digital transformation efforts, including data deduplication, GDPR compliance, and the promotion of flexibility to meet the evolving needs of citizens. In Romania, the article highlights the need to accelerate public sector digitization in response to the COVID-19 pandemic and the importance of building trust in digital institutions. In Estonia, the process through which it has become an example of best practises in the digitalisation of public institutions at the European level will be analysed, with a focus on their advancements in information technology development. In Sweden, the case study provides an overview of the complexities of digitizing paternity records, underscoring the need for changes to existing regulations and careful consultation with all stakeholders. In Latvia, the article explores efforts to bridge the digital divide, support small and medium companies in adopting information and communication technologies, and promote cybersecurity. These case studies offer valuable lessons about the complexity and challenges of digital transformation in public administrations. They underscore the importance of consultation and stakeholder preparation, adaptability to change, and alignment of technology with societal values and needs. Digital transformation is not only a technological change, but also an opportunity to improve governance and services for citizens.

KEYWORDS: *digital transformation, public administration, case study, modernization, public sector digitization.*

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1. INTRODUCTION

In today's digital age, the role of technology in governance is of paramount importance. The digital transformation of public administration has become an imperative necessity to ensure efficiency, transparency, and citizen-centric services (Idzi & Gomes, 2022; Priyadarsini & Kumar, 2022; Sanina et al., 2023). However, this journey towards digital governance is not without its challenges, especially when faced with outdated and disconnected legacy systems that hinder progress and increase security risks.

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As highlighted by Al-Muwil et al. in a 2019 study, instilling a "digital by default" ethos in public administration is often hindered by the presence of outdated legacy systems that operate in isolation and are incompatible with contemporary IT environments. This can lead to inefficient processes, high operational costs, and significant data security risks (Irani et al., 2023). The European Commission's e-Government Action Plan, which aims to gradually replace IT systems older than 15 years, underscores the urgency of addressing this situation (European Parliament and Council of the European Union, 2015).

Denmark, as an eloquent example, faces this challenge, but has adopted a progressive modernisation approach. This approach involves a systematic evaluation of legacy systems to identify those that can be updated and their integration with more recent IT solutions. Furthermore, recognition of imminent organisational changes and effective change management have been critical aspects of this transformation.

Similarly, the Netherlands, with a massive digital modernisation project, has wisely addressed these challenges. Through the elimination of duplicate data, GDPR compliance, and increased flexibility, they have demonstrated the importance of meticulous planning, close coordination, and adaptability.

In this context, Romania has acknowledged the need to accelerate the digitalisation of the public sector, not merely as a temporary adaptation to current circumstances, but as a profound change to become more efficient and transparent. However, to gain the trust of citizens in digital services, it is essential to address not only the technological aspect, but also the reputation of institutions (Alkraiji & Ameen, 2022; Hartanti et al., 2021; Hooda et al., 2022; Li, 2021).

Additionally, Sweden has faced the complex challenges of digitisation in the process of registering paternity. This has highlighted the importance of synchronising technology with existing structures, societal values, and public needs.

Although Latvia stands out for its efforts to improve digital skills and modernise digital governance, it recognises that a holistic approach is essential to ensure that the benefits of digitisation reach the entire population and businesses.

The Estonian state has focused on investing in the development of informational infrastructure to become one of the best examples in Europe for the digitalisation of public institutions.

These case studies reveal that, although digital transformation can bring significant benefits, it is a complex and challenging journey. The approach must be carefully and well planned, involving stakeholder consultation, adaptability, and meticulous change management (Papavasiliou & Gorod, 2022; Pedrini & Ferry, 2019). It is not just about technology; it is also about adapting to the profound changes in society (Hanelt et al., 2021; Nadkarni & Prügl, 2021; Schneider & Kokshagina, 2021; Vukšić et al., 2018). Ultimately, digitisation of the public sector must align with the values and needs of citizens, thus contributing to more efficient, transparent, and citizen-centric governance.

2. DIGITAL TRANSFORMATION IN PUBLIC ADMINISTRATION: DEEPENING MODERNISATION OF THE "LEGACY SYSTEM" IN DENMARK

In the digital era, technology plays a fundamental role in governance. However, adopting a "digital by default" ethos in public administration is often hindered by the persistence of outdated legacy systems that operate in isolation and are not seamlessly integrated into contemporary IT environments (Al-Muwil et al., 2019; Weerakkody et al., 2012). This situation generates inefficient processes, increased operational costs, and significant security risks (Irani et al., 2023; Kitsios et al., 2023). In this context, the European Commission's e-Government Action Plan, which aims to gradually replace IT systems older than 15 years, demonstrates the urgency of the modernisation need (European Parliament and Council of the European Union, 2015).

2.1 Denmark and the Necessity of Digital Transformation

Denmark has embarked on an ambitious digital transformation process, particularly in the context of integration with the systems of the European Union. Efficient information exchanges, such as declarations and requests, between customs authorities, the European Commission, and other entities have become imperative with the imposition of new requirements from the European Union Customs Code.

With over 25 legacy systems, some dating back to the 1990s, Denmark's public administration faced a considerable challenge in ensuring compliance with these requirements. A detailed analysis of the existing systems revealed several deficiencies, such as their inability to handle the new data recording and processing requirements, as well as technical limitations, including incompatible data formats. Additionally, the lack of adequate documentation and plans for legacy systems complicated understanding of their functionality and use, making the integration process challenging.

To address this monumental challenge, Denmark adopted a progressive approach to modernisation. This strategy involved mapping and performing detailed evaluations of legacy systems, with a focus on their functionality and potential for updates. With integration identified as a critical element, efforts were concentrated on ensuring efficient collaboration between old and new systems, paving the way for future improvements.

Recognising that changes in organisational workflows were inevitable, the modernisation process emphasised the importance of change management. This aspect was crucial to ensure that personnel and resources were directed correctly and efficiently within the transformation process.

A significant element of Denmark's modernisation process was the adoption of agile project management techniques. This approach promoted teamwork, continuous adaptability, and mutual trust, contributing to the constant progress of the project.

Denmark's experience underscores the complexity of digital transformation in public administration, especially when dealing with legacy system challenges. This case study illustrates that digital transformation is not limited to technological updates, but also involves profound changes in management processes and practises. The agile approach, coupled with meticulous planning and intensive collaboration, can provide a successful path toward more efficient, transparent, and citizen-orientated governance.

2.2 Digitalisation projects for public services in Denmark

In terms of actions initiated towards the transition to a digital era, in the year 2000, in Denmark, the information society began to take shape with the establishment of the Digital Administration Commission, subordinate to the Ministry of Finance. The purpose of this commission was to introduce a common markup language (XML) and promote the use of electronic signatures in the public sector.

In 2002, the first e-Government strategy was launched, with a focus on improving public services, increasing efficiency, adopting new approaches, and transforming government organisations and processes.

The year 2003 brought an important innovation - the infrastructure necessary for the development of the information society, which allowed public institutions to transmit documents electronically and request information in the same manner.

In 2004, a new e-Government strategy was adopted, with the primary goal of transforming the public sector into one focused on the needs of citizens, efficient, and capable of providing high-quality services.

Beginning in 2005, citizens of Denmark were provided with the right to communicate electronically with public authorities and receive responses through electronic means. In August of the same year, authorities launched an extensive awareness campaign about the services offered through e-

Government, and four months later, public institutions were mandated to make payments exclusively through electronic transfer.

Furthermore, the introduction of a dedicated web service for pensioners represented an innovative opportunity to promote e-Government, as providers of private pension systems automatically received information when a citizen received an early public pension.

In 2007, Denmark's national e-government portal was launched, accessible at https://www.borger.dk/. The e-Government strategy for the period 2007-2010 aimed primarily to strengthen cooperation within the public sector and was quickly adopted by the government, local authorities and the five Danish regions. Soon, an agreement was reached between the government, local authorities, regions, and a private provider to develop an innovative electronic signature.

In 2008, the Ministry of Science, Technology, and Innovation in Denmark supported the launch of open-source software, and in 2010, "NemID," an electronic signature providing secure access to online self-service services for Danish citizens, was introduced.

In 2011, the Ministry of Science, Technology and Innovation initiated a project that awarded 15 scholarships to students to improve open-source software dedicated to the Danish public sector, benefiting both students and authorities.

In line with the public sector digitisation strategy for the period 2011-2015, the main goal was to provide all online services to Danish citizens. From 2015, communication with public authorities is exclusively conducted online, and all citizens are required to have a digital mailbox for notifications from public institutions, which facilitates transactions.

The transition to digital services became imperative for most countries, including Denmark, which took drastic measures to ensure the quality of citizens' lives through e-services. Paper communication is no longer an option, and government agencies must support individuals with low qualifications or disabilities to use electronic services, making them more accessible and reducing assistance service costs.

A crucial element in the Danish government's environmental plan was the "Joint Public Strategy for Digital Welfare 2013-2020," which aimed to release resources worth DKK 12 billion (1.6 billion euros) in 2020 by modernising the public sector. This strategy emphasises digitisation and the use of digital technologies in the provision of public services, including education, to improve the user experience. Education projects involve multiple stakeholders, including teachers, to ensure the successful implementation of digital technologies in public schools (Agency for Digital Government, 2021).

In the healthcare sector, digital technology plays a crucial role in improving the efficiency and effectiveness of national healthcare systems. Digital networks help reduce errors and costs in communication between healthcare providers and patients, as well as prevent abuse and drug trafficking. The Danish portal Sundhed.dk facilitates communication between healthcare providers and patients (OECD, 2016).

In 2012, the Danish government and local administrations developed a common strategy to increase the use of information and communication technologies in primary schools. This strategy covers all 98 municipalities, approximately 1,700 schools, around 49,000 teachers, and 580,000 students under the umbrella of the Danish government's national e-strategy. Key elements of the strategy include developing the market for digital learning resources, ensuring efficient IT infrastructure in schools, promoting knowledge of technology-based learning, and supporting the use of IT and digital resources through networking and knowledge exchange.

By 2014, all municipalities had implemented the necessary infrastructure and investments in ICT had increased significantly, facilitating digital learning.

3. CASE STUDY: THE NETHERLANDS

The Netherlands, recognised as one of the pioneers of digital transformation in the public sector, embarked on a vast project to modernise data management at the municipal level. The primary objectives of this project were to eliminate data duplication, ensure compliance with the General Data Protection Regulation (GDPR), and create a more flexible infrastructure to respond quickly to changing citizen needs. To achieve these goals, a comprehensive review of the system was conducted, with a focus on developing a new architecture that included data storage, service applications, integration with legacy systems, process sequencing, and interactions with other platforms.

A pivotal point in this process was the implementation of the "Natural Language Platform (NLX)," a peer-to-peer data exchange system supported by federal authentication and secure connectivity protocols.

With an estimated budget of 150 million euros and an implementation duration of approximately a decade, digital transformation in the Netherlands required close collaboration among numerous municipalities, government departments, ministries, and IT service providers. Critical decisions were made regarding which elements of legacy systems should be modernised and what should be retained, always considering the impact on processes. Effective coordination was necessary given the large number of stakeholders involved, from municipalities to government departments and IT experts.

Furthermore, the development of staff skills and investments in their training were crucial as radical changes became the norm. Strong leadership was also a key element in gaining support from various public entities and ensuring progress within the transformation.

The Netherlands' experience with digital transformation in the public sector highlights the complexity and importance of this transition. The challenges, from system integration to effective stakeholder participation, provide valuable lessons for public administrations around the world. As governments move toward providing more integrated and transparent digital services, understanding, adapting, and learning from such large-scale transformations become not only beneficial but also essential for the future success of public administrations.

4. DIGITALISATION IN ROMANIA'S PUBLIC ADMINISTRATION: A CASE STUDY

The COVID-19 pandemic has caused an urgent need for rapid adaptation and integration of digital solutions in various sectors around the world. Romania is no exception, where the digitalisation of the public sector has become imperative to address new challenges. This move toward digitalisation in public administration is not merely a temporary response to current circumstances, but signifies a profound shift towards improved transparency, efficiency, and convenience. According to Toderean et al. (2020), the COVID-19 pandemic is likely to accelerate technological advancements, given the increasing prevalence of remote work and the growing need for digitalisation (Baesu, 2021).

Digitalisation in Romania's public administration has the potential to significantly improve institutional efficiency and provide a strategic advantage, as highlighted by Baesu (2021). It can make public services more accessible and citizen-centred. However, it is important to note that trust in these digital institutions is often determined by their online reputation and citizens' experiences in their interactions with them.

4.1 Romania's Path to Digitalisation

Romania had already begun the process of transforming its public administration before its accession to the European Union. However, with the increasing pace of digitalisation and the current global context, there is an urgent need to adopt modern administrative methods to enhance

the country's image and credibility. It is important to note that, despite progress, Romania scored low in European rankings, such as the 2018 Digital Economy and Society Index (DESI), ranking last among EU member states with a score of 33.21, significantly below the European average of 52.25. However, by 2020, the country had gradually climbed to the 26th position (Baesu, 2021).

4.2 The Romanian Government's Efforts in the Post-Pandemic Era

The post-pandemic era has witnessed significant steps taken by the Romanian government to accelerate the process of digitalisation. Two crucial governmental decisions were made in this regard. Firstly, Government Decision No. 89/2020 established the Romanian Digitalisation Authority (ADR), an institution focused on IT, the information society and the national interoperability framework. Second, Government Decision No. 90/2020 established the Ministry of Transport, Infrastructure, and Communications, thereby consolidating the electronic communications sector.

As part of these efforts, accessible digital platforms and services for citizens were introduced, such as the electronic public procurement system, the national electronic public administration system and the Ghiseul.ro platform. Furthermore, the launch of the aici.gov.ro platform in April 2020 marked a significant step toward digital documentation and efficient interaction with public institutions.

Digitalisation in Romania's public administration reflects the ongoing need to adapt and modernise the public sector in the face of current challenges. The benefits of digitalisation, including cost reduction, increased productivity, increased transparency, and accountability, are undeniable. Romania's experience in digitalising public administration offers valuable lessons for other countries.

It underscores the importance of prioritising digital readiness and adaptability and ensuring that technological advancements effectively serve the needs and facilitation of citizens. The digital evolution in public administration is not just about technology, but also about building citizens' trust, engagement, and efficiency in delivering citizen-centric public services.

Electronic governance is at the core of modernisation and public management reform, where technology serves as the essential tool adapted to administrative structures and processes with immense potential in restructuring the information needs of administrative institutions (Adamescu, 2020).

4.3 Analysis of the Digital Economy and Society Index (DESI) in Romania

According to the composite index of the 2022 DESI study, Romania falls below the European average in all five dimensions, holding lower positions regarding the digitisation of services provided by the public administration. Romania faces several challenges in terms of human resources, with a low level of basic digital skills compared to the EU average. However, Romania stands out for having a significant number of women specialised in information technology and communications (2nd place) and ranks 4th in the number of graduates in this field.

In the EU-level ranking of basic digital skills in Romania, it ranks last among the 27 countries on individuals with digital skills who are employed.

Regarding the dimension of human capital of the DESI indicator, Romania also records a score below the European average in terms of the number of specialists in information technology and communications (ICT) employed in this sector, with a figure of 2.6% compared to the EU average of 4.5%. However, this percentage is steadily increasing. On the other hand, the number of women specialists in the ICT field and the number of women graduates in this field remain high, reaching 26% and 6.7%, respectively, and continue to rise. Regarding the provision of ICT training, the share of companies offering such programmes stagnates at 6%, well below the EU average.

To enable access to digital services for all citizens and maintain prosperity, Romania needs a high-performance, secure, and sustainable digital connectivity infrastructure optimised to utilise the latest fibre optic technologies in fixed networks and to connect innovative wireless systems such as 5G, 6G and Wi-Fi.
The use of digital technologies provides businesses with the opportunity to gain a competitive advantage, improve the quality of the services and products they offer, and expand their market presence. In a recent study conducted by McKinsey, 93% of business directors in the EU surveyed consider better access to data important for their organisation (with approximately 40% indicating it as very important) (McKinsey, 2020).
Digital public services remain a significant challenge for Romania. The country performs well below the EU average in various indicators, such as accessibility to digital public services for citizens (with a score of 44 compared to the EU average of 75) and for the business environment (with a score of 42 compared to the EU average of 82). Online collaboration between public institutions and citizens is also limited, with only about 17% of internet users using e-government platforms.
However, there is an opportunity to address these issues, thanks to significant investments in the digital field and planned reforms within Romania's National Resilience and Recovery Plan.
The successful implementation of these measures could contribute to achieving the digital decade's objective of providing 100% of online public services to citizens and European businesses by 2030.
It is essential to note that Romania currently lacks an electronic identification system. However, the introduction of electronic identity cards and digital signatures for Romanian citizens is foreseen, which would facilitate interactions between public institutions and the private sector.
In the National Resilience and Recovery Plan, resources worth 200 million euros are allocated for the production of 8.5 million digital identity cards. These documents will contain two digital certificates that enable online authentication to access public services and use electronic signatures.
Furthermore, investments funded through the National Recovery and Resilience Plan have the objective of expanding online access to essential public services and creating a unified infrastructure for the government cloud. These include the implementation of the government cloud (with a budget of 675 million euros), the development and migration to the cloud (with an allocation of 187 million euros), the improvement of the e-health and telemedicine system (with a budget of 400 million euros), digitisation in the legal sector (with 162 million euros), digitisation in the environmental protection sector (with 52 million euros), and in the labour market and social protection sector (with 85 million euros).
Furthermore, the introduction of electronic forms in the public procurement domain (with 0.85 million euros), digitisation in the nongovernmental organisations sector (with 10 million euros), and the improvement of public service management (with 10 million euros) are also planned.

5. THE DIGITAL TRANSFORMATION OF PATERNITY REGISTRATION PROCESS IN SWEDEN: COMPLEXITY AND CHALLENGES

Digital transformation in the public sector is often seen as a promising path to increase efficiency, reduce bureaucracy, and improve public services. However, Sweden's case, which aims to digitise the paternity registration process, offers valuable insights into the complexities and challenges inherent in such initiatives.

5.1 Legal Context in Sweden

In Sweden, the legal relationship between parents and children is governed by the Children and Parents Code, legislation established in 1949, initially designed for a society where most parents were married. According to the traditional process, maternity is reported during pregnancy and

unmarried parents must visit the Family Office after the child's birth to sign a legal paternity confirmation form. This process ensures the official registration of both parents, the child's right to the father's surname, and inheritance rights from both parents. However, with changing social norms, especially diversity of family structures, the traditional process became inadequate and, at times, intrusive (Lindgren & van Veenstra, 2018).

5.2 Motivations for Digitalisation

In 2013, the Swedish Tax Agency and the Swedish Association of Local and Regional Authorities (SKL) initiated a preliminary study to assess the feasibility of a digital service to support the paternity recognition process. The motivations for this initiative were clear:

- ✓ Reduce time-consuming bureaucracy.
- ✓ Address the discomfort associated with intrusive questions about conceiving a child.
- ✓ Modernise manual steps and improve data transfer between organisations.

During the preliminary study, it was found that many family situations approved by the Family Offices were not covered by the Children and Parents Code in its current form. Societal developments, such as the increasing number of single mothers using in vitro fertilisation, same-sex parents, and adoptions, made the traditional process unsuitable for most situations. Transforming this service into a digital one without violating the Code seemed like an impossible task. Administrative aspects, such as the need for physical witnesses and ink signatures, further complicated the transition to the digital environment.

5.3 Changing the Code and Administrative Challenges

The digitalisation initiative highlighted the need to modernise the Children's and Parents Code. This change was not only an administrative challenge but also involved a national discussion about evolving parental definitions. However, as of 2018, the Code remained unchanged, and the goal of a complete electronic service was not achieved. However, efforts were made to digitally transmit information between Family Offices and the Tax Agency and to harmonise the interpretations of different agencies managing the Code.

Sweden's case underscores the importance of careful planning before embarking on digitalisation projects in public administration. This involves establishing a clear strategy, consulting with all stakeholders, and anticipating potential roadblocks. Decisions made to improve efficiency must remain flexible to address unexpected challenges. Digital transformation is not just about implementing technology but also preparing all involved parties, from office workers to the general public, for imminent changes. Furthermore, digital projects, especially in the public sector, should not overlook the legal and ethical complexities that shape and regulate services.

The Sweden case study once again highlights the complexity of the public-service digitalisation process. It demonstrates that while technology can provide solutions, it must be in line with existing regulations, social values, and public needs. For public administrations around the world, this case serves as a reminder that digitalisation holds immense promise, but the journey requires careful navigation, collaboration, and adaptability. It is not just about implementing technology but synchronising it with the ever-evolving fabric of society. As Flyvbjerg (2006) rightly emphasised, atypical cases often reveal more, and there is much to learn from Sweden's efforts.

6. DIGITAL TRANSFORMATION IN THE PUBLIC SECTOR: THE CASE OF LATVIA

The digitalisation of the public sector represents a significant opportunity to improve the efficiency, transparency, and accessibility of services to the population. Latvia stands out as an eloquent example of a nation committed to a robust journey of digital transformation, with all the challenges and complexities associated with such an endeavour.

6.1 Promoting Digital Skills among the Population

Latvia recognised the urgent need to improve digital skills among its population. With both businesses, especially small ones, and the general population lagging behind in Internet usage, the government-initiated measures to bridge this gap. Taking inspiration from the practise in countries such as Australia and Norway, Latvia introduced community-level information technology and communications training programmes and encouraged employers to participate in curriculum definition. Emphasis was also placed on developing links between vocational schools and businesses and simplifying workplace training support procedures.

6.2 Boosting Technology Adoption in Small and Medium Enterprises

Latvia recognises the need to stimulate digital adoption, especially among small and medium-sized enterprises (SMEs). Inspired by the Australian model, Latvia proposed a "Digital Champions Programme", whereby the government provides support to SMEs in sectors with low adoption of information technology and communications. Additionally, the integration of business payroll software has been recommended to facilitate automatic data reporting to tax authorities, drawing on Australia's Single-Twist system.

Latvia aims to develop a comprehensive digital government structure. This includes consolidating funding for digital governance under a single ministry, encouraging businesses to interact with the government online, and gradually phasing out offline e-Governance services. These measures reflect the practises adopted in countries such as the United Kingdom, the Czech Republic, and Finland. Particular emphasis is placed on creating an open data ecosystem and promoting electronic health.

6.3 Cybersecurity and Data Protection

Security remains a priority in digital transformation. Latvia has made significant progress in this area by establishing institutions such as CERT.LV, recognised for its technical expertise. The country's recent cybersecurity strategy for 2019-2022 strengthens its commitment to digital security. However, it is essential to adopt a holistic approach that covers both national and economic aspects of cybersecurity.

After implementing the General Data Protection Regulation (GDPR) and the Personal Data Protection Law (PDPL) in 2018, Latvia has actively enforced individual privacy rights. Initiatives like the Global Privacy Enforcement Network (GPEN) underscore the global dimension of data privacy. Furthermore, Latvia aims to strengthen consumer protection, particularly in e-Commerce, by increasing public awareness and enhancing cross-border law enforcement cooperation.

6.4 Latvia's Vision for 2030: Digitalisation and Sustainable Development

Latvia's vision for 2030 is closely tied to digitalisation. Digitalisation is seen as a catalyst across various sectors, including access to culture, lifelong education, and eco-efficiency in business. Special attention is also paid to the use of digitalisation to drive regional development and government innovation. This well-defined vision facilitates anticipation and management planning, ensuring that digitalisation is integrated into its future trajectory.

As electronic services become increasingly central, organisational structures may undergo significant changes, potentially migrating toward a fully online model. Coordination in this era requires not only an understanding of the digital environment, but also the ability to pioneer in an ever-changing digital context. The availability of real-time data from interconnected systems improves the accuracy and efficiency of project monitoring and evaluation.
The journey of Latvia illustrates the multiple advantages of digitalisation in the public sector. From improving skills to promoting a robust digital government structure, the steps taken by Latvia are commendable.

7. DIGITAL TRANSFORMATION IN THE PUBLIC SECTOR: THE CASE OF ESTONIA

Estonia is considered the most digitalised country in the world, a genuine example of the transition to an information society, with its astonishing speed and scale. Over the past 10 years, Estonians have focused on the development of information technologies, making a notable mark in this field. All schools and government institutions have computers, and the Wi-Fi internet covers the entire country. Access to the Internet is considered a social right, and most banking transactions, income declarations, and medical prescriptions are managed electronically.

7.1 Government Facilities for Citizens Regarding the Services Offered

The e-Government portal www.eesti.ee connects more than 800 institutions, providing Estonians with a wide range of information and services. The government has created a website where the public can review and comment on legislative projects, proposing amendments to existing laws. Since 2002, Estonia has offered free Wi-Fi in crowded areas and introduced online voting in 2005. In 2012, an extensive fibre optic network was installed and 94% of taxes are paid online.
In 2000, the Estonian Government eliminated paper from Cabinet meetings, using an online document system for meeting preparation and execution. Ministers can vote and make comments online, accelerating the decision-making process. This digitalisation miracle was made possible through a partnership between an innovation-driven government and a proactive IT&C sector.
Currently, the development of e-Governance and e-Democracy in the Information and Communications Technology field in public administration relies on major projects. Simple interface systems have been developed for various purposes, such as tax payments, citizen deductions registration, business registration, or traffic fine payments. Institutional databases have been interconnected, allowing authorities to automatically access information from other authorities, eliminating the need for certificates issued by different institutions.
The Estonian state has implemented the "once-only" principle, meaning that the same information is not requested multiple times by different institutions from citizens. This principle has significantly reduced bureaucracy and is complemented by the "Big Brother in reverse" principle, which allows citizens to check in real-time who accessed their data and when. Citizens can seek clarifications from authorities in case of doubts or uncertainties about the verified data.
To access the computer systems, each Estonian citizen receives a digital identity card with an embedded chip at the age of 15, which can be inserted into a computer-connected reader. To prevent identity theft, the system uses two PIN codes, which must be entered after reading the card.
All Estonians also have a digital signature created based on the digital identity card, which they can use to authenticate electronic documents. Furthermore, for several years, mobile identity is available through the chip in the mobile phone provided by the mobile operator (European Commission, 2023).
Using electronic signatures brings the country annual savings of 2% of its GDP. Furthermore, with the help of this card, the holder can carry out various activities without leaving their home, such as paying for banking and utility services, enrolling a child in school or kindergarten, registering a

company in just 18 minutes, monitoring a child's academic performance, seeking medical consultations, and ordering medication from pharmacies.
Through digital identity, more than 90% of the legal actions that required citizens to visit various companies or institutions can now be performed using a smartphone, laptop or tablet. Estonia ranks at the forefront of digitally advanced countries around the world.
A notable example of innovation in voting is the introduction of online voting in Estonia in 2005, making it the first country in the world to successfully implement such a system. Through this system, any Estonian citizen with the right to vote can cast their ballot from anywhere in the world with just a few clicks, using an internet connection, and it takes only about three minutes to complete the voting process. This system is characterised by its simplicity and, most importantly, its ability to eliminate the risk of vote manipulation. This is because only the last vote cast by a citizen before the polls close is considered, regardless of how many times they choose to vote.

7.2 The most significant projects that involve the development of digital infrastructure

Estonia's data communication infrastructure was developed through two major projects, known as PeaTee (Main Road) and KülaTee (Village Road). The purpose of these programmes was to provide data communication services to local government agencies, schools, and libraries. This infrastructure was built in rural areas to ensure continuous internet access and data communication services. As a result, approximately 99.4% of public sector jobs now have internet access.
The X-Road programme aims to modernise national databases and transform them into a common and public resource for service provision. This allows government agencies, legal entities, and citizens to access data from national databases over the Internet, provided that they have the right to do so. Using these services requires authentication, which can be done through the Estonian identity card or online bank authentication codes.
E-Citizen is a national project that aims to facilitate collaboration between Estonian citizens and the public sector through the Internet. Initially, the project aimed to create an online portal for citizens, but it later evolved into a unique solution that allows citizens to become part of the information society. Each citizen has a personal virtual office accessible with his or her identity card. Through this virtual office, citizens can interact with all other state information systems, and these systems are obligated to communicate with the citizen's office and provide information on the status of their document processing. In this way, citizens no longer need to search for services; they can request and monitor their processing without leaving their virtual office.
At the end of 2014, Estonia launched the innovative e-residency programme, unique in the world. This Estonian e-residency electronic card is available to non-residents of Estonia and allows them to access all the digital services offered by Estonia, as well as electronically sign documents. Estonia currently offers approximately 4,000 online services accessible to all Estonians and Estonian residents.

8. CONCLUSIONS

In the current digital era, technology plays a fundamental role in governance. The digital transformation of public administration is now an imperative necessity to ensure efficiency, transparency, and better services for citizens. However, this transition to digital governance is not without challenges, especially when dealing with outdated and disconnected legacy systems that hinder progress and increase data security risks.
A study by Al-Muwil et al. (2019) highlighted that instilling a "digital by default" ethos in public administration is often impeded by the presence of outdated legacy systems that operate in isolation and are incompatible with contemporary IT environments. This situation can lead to inefficient processes, high operational costs, and significant data security risks (Irani et al., 2023). This aligns

with the European Commission's e-Government Action Plan, which aims to gradually replace IT systems older than 15 years (European Parliament and Council of the European Union, 2015).
A prominent example in this regard is Denmark, which faces this challenge, but has adopted a progressive modernisation approach. This approach involves a systematic evaluation of legacy systems to identify those that can be upgraded and integrated with newer IT solutions. Additionally, recognising impending organisational changes and managing change have been critical aspects of this transformation.
The Netherlands provides another example with a massive digital modernisation project. They have wisely tackled challenges by eliminating duplicate data, ensuring GDPR compliance, and enhancing flexibility, showcasing the importance of careful planning, close coordination, and adaptability.
Meanwhile, Romania has recognised the need to accelerate the digitalisation of the public sector, not just as a temporary adaptation to current circumstances but as a profound change to become more efficient and transparent. However, to gain citizens' trust in digital services, it is essential to address not only the technology but also the institutions' reputation.
Sweden has faced the complex challenges of digitalisation in the paternity registration process. This has underscored the importance of synchronising technology with existing structures, societal values, and public needs.
Although Latvia stands out for its efforts to improve digital skills and modernise digital governance, it recognises that a holistic approach is essential to ensure that the benefits of digitalisation reach the entire population and businesses.
The Estonian state has invested heavily in the digitalisation of public institutions, turning Estonia into a prime example of excellence in electronic governance. This innovative approach has resulted in numerous benefits for its citizens and non-residents, facilitating access to public services, saving time and money, and streamlining administrative processes.
All these case studies show that, while digital transformation can bring significant benefits, it is a complex and challenging journey. The approach must be carefully and well planned, involving stakeholder consultation, adaptability, and careful change management. It is not just about technology, but also about adapting to profound social changes. Ultimately, digitalisation of the public sector must align with citizens' values and needs.

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